

WALTER ANDERSON

PERSONAL COPY

HELENA SOLID WASTES  
BETTERMENT PROJECT  
ANNUAL REPORT

JULY 1970 - JUNE 1971

FOR

THE CITY OF HELENA

45  
THOMAS, DEAN & HOSKINS INC.  
ENGINEERS  
GREAT FALLS - BOZEMAN, MONTANA

**WITHDRAWN**  
**WITHDRAWN**

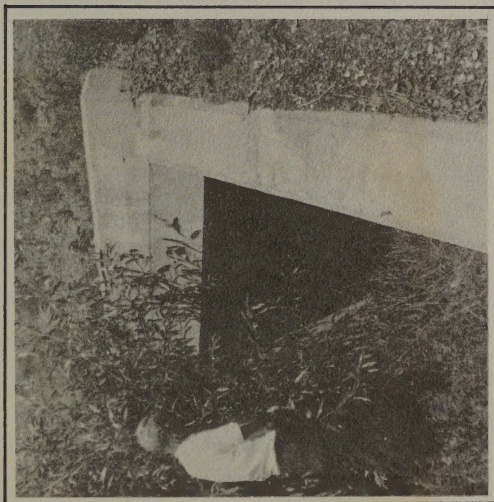
Montana State Library



3 0864 1007 0404 1







Sanitary facilities were not available at the  
landfill site





HELENA SOLID WASTES BETTERMENT PROJECT

ANNUAL REPORT

JULY 1970 - JUNE 1971

for

THE CITY OF HELENA

Bureau of Solid Waste Management  
1-D01-UI-00227-01

This project is financed in part by a U.S. Public Health Service demonstration grant entitled "Demonstration of Benefits from Improvements to a Solid Waste System for a Small Community."

Thomas, Dean & Hoskins, Inc.  
Engineers  
Great Falls - Bozeman, Montana



# HELENA SOLID WASTES BETTERMENT PROJECT

## TABLE OF CONTENTS

	<u>Page No.</u>
SECTION I INTRODUCTION	1
SECTION II SOLID WASTE COLLECTION	3
SECTION III RESIDENTIAL STORAGE	7
SECTION IV COMMERCIAL STORAGE	13
SECTION V DISPOSAL FACILITIES	17
SECTION VI PROJECT COST ACCOUNTING	24
APPENDIX: Location Map	
Residential Container Storage Site Survey	Exhibit A
Residential Plastic Bag Questionnaire Results	Exhibit B
Residential Observation Area - Data Summary Prior to Placement of Cans and Racks After Placement of Cans and Racks	Exhibit C
Residential Rack & Can Questionnaire Results	Exhibit D
Commercial Observation Area - Data Summary Prior to Installation of New Bulk Containers After Installation of New Bulk Containers	Exhibit E
Bulk Container Time Survey Summary	Exhibit F
Forms for Cost Accounting	1 - 11

\* \* \* \* \*







## SECTION I - INTRODUCTION

The City of Helena recently completed the second year of a three year solid wastes study. Financing of the study is through a Federal Grant from the Department of Health, Education and Welfare with a portion of the funding from the Helena Model Cities program. The City of Helena's share of the cost is in the way of equipment rental and other non-cash contributions.

The purpose of the Helena Solid Wastes Project is to demonstrate the benefits derived from certain improvements to the Helena Solid Waste System. The project objectives are:

- A. To purchase, install, and maintain bulk containers as justified to reduce costs and improve sanitary and environmental conditions.
- B. To purchase, install, and maintain residential storage containers in a selected portion of the City to reduce operating costs and improve sanitary and environmental conditions.
- C. To develop a sanitary landfill site at a location centrally located within the City.
- D. To establish a detailed system of record keeping and cost accounting.

The selected residential study area has received uniform types and sizes of garbage cans and racks. Homeowners with curb-side pickup also received plastic liner bags for curb-side placement. These storage facilities replaced many different types of containers and racks.





The commercial sites selected under the study now have bulk containers in place of the original garbage cans .

A new sanitary landfill site located near the downtown area of Helena is now in use .

Operational costs of the solid waste collection, haul, and disposal are being recorded through a cost accounting system which was expanded this year to give a more detailed breakdown. Cost data is being kept separately for residential, commercial, and bulky waste operations.





## SECTION II - SOLID WASTE COLLECTION

The City of Helena offers residential, commercial, and bulky waste collection service for all residents and businesses of Helena. The amount of industrial waste is negligible.

At the beginning of this study in 1969 there were three residential collection crews and two commercial collection crews. The collection operation has been reorganized to one commercial crew and four residential crews. The 1969 routes that were classified as commercial routes actually included residential pickups on their routes. By eliminating the majority of these residential stops on the commercial routes and combining the commercial stops it was possible to collect all the commercial refuse on one route. A 20 cubic yard mechanical packer collection vehicle was purchased to replace a 16 cubic yard packer previously being used on this commercial route.

Residential collection is made twice a week by crews consisting of one driver and two pickup men. This year the crews have gone to a standard 40 hour work-week, instead of the incentive type workweek previously in effect. The incentive type operation caused problems with damaging refuse containers, leaving litter in the alleys, and an above average accident rate. When the employees work over eight hours they receive time and one-half pay.

Drivers of collection trucks receive \$500.00 per month. The collectors or pickup men on the crews receive \$470.00 per month. Landfill heavy equipment operators receive \$550.00 per month and landfill attendants (scale operators, etc.) receive \$450.00 per month.





Rerouting of all residential routes during the past year has equalized the work load of the crews. The routes are now scheduled so that each crew works a collection route four days per week. The fifth day the crews perform other work for the sanitation department.

The following trucks are used on the residential collection routes:

<u>Truck No.</u>	<u>Truck Type</u>	<u>Compactor</u>	Bulk Container <u>Lift</u>	<u>Original Cost</u>
#91	1971 Dodge	20 CY Garwood	Yes	\$21,000
#27	1968 Dodge	16 CY Leach	Yes	\$ 9,288
#31	1964 Ford	16 CY Heil	Yes	\$ 8,263
#43	1962 Chevy	16 CY Heil	No	\$ 8,281

The following are used only in cases of emergency:

#89	1960 International	20 CY Leach	Yes	Donated
#28	1950 International	16 CY Leach	No	\$ 8,500

The 1960 International and the 1950 International are used only when the regular route vehicles are being serviced or repaired.

Total residential truck mileages vary from 22 to 27 miles per day. This includes haul, disposal, and route mileages.

Truck #91 is used for both commercial and residential collection. Some commercial sites are serviced six nights per week while others are serviced less often depending on the amount of refuse. To avoid traffic, collection is made between 4:00 P.M. and midnight. No collection is made on Sunday.





The commercial route crew works a standard 40 hour workweek with one of the residential crews filling in on the sixth night.

The commercial route length including haul varies from 23 to 27 miles per day depending on the storage sites to be serviced.

Bulky waste collection routes are essentially the same as last year. Two collection routes cover the entire City on a continuous basis. The two-man crews collect the material that is not normally collected on the residential and commercial routes. The frequency of collection varies with the amount of refuse generated at each site .

These crews will also collect bulky waste upon request by any resident.

This year some of the commercial pickups were eliminated by assigning this work to the bulky waste crews. These changes were made because of the inefficiency in handling uncrushed cardboard boxes in a mechanical packer truck. The bulky waste crews can crush the boxes themselves and haul them on their flat bed trucks.

The following equipment is used on the bulky waste collection routes:

<u>Truck No.</u>	<u>Truck Type</u>	<u>Capacity</u>	<u>Original Cost</u>
#18	1970 Ford	1 Ton	\$3,793
#16	1970 Ford	1 Ton	\$3,793

Route lengths vary from day to day for these trucks , with a range of 24 to 35 miles per day depending on the rubbish quantities at the storage sites .



In the fall of 1970 a new disposal site located within the City was placed into operation. All refuse now goes to this site except junk auto bulks.

This year more emphasis has been placed on enforcement of the Helena Solid Waste Code. Particular effort has been directed toward eliminating littering at all refuse storage sites. The City-County Health Department and the City Sanitation Department are working together on code enforcement.





### SECTION III - RESIDENTIAL STORAGE

A residential study area was selected in Helena to demonstrate the effects of improving the refuse storage facilities. (See location map in appendix of this report.) The residential area chosen to receive these facilities was one that had substandard storage. The layout of the streets, curbs, and alleys in the area are representative of the City as a whole.

In this area the substandard residential storage units were replaced with a metal rack and two galvanized garbage cans. The objective was to observe and record the crew efficiencies, sanitation conditions, and esthetics of the storage sites before and after making the improvements. (See photos at the end of this section.)

The City is built on hilly terrain with mountains extending into the south end of the City. The north portion of the City has flatter terrain. Some of the streets in Helena have 5-10% grades. In the winter when the streets are icy some collection trucks are rerouted in order to serve the homes in the hilly areas. The residential study area selected consists of both hilly and flat areas. The alleys in the study area are 16 feet - 20 feet in width.

The normal annual precipitation for Helena is only 10.9 inches per year with an average of 45 inches of snowfall per year. There are only 30 days per year on the average when the precipitation, including rain or snow, exceeds 0.10 inch in depth. Precipitation amounts are seldom severe enough





in Helena to adversely affect the solid waste collection operation there.

The size of the study area chosen was sufficient to obtain good study data and yet not so large as to limit personal contact with each homeowner. There are 495 occupied dwelling units in the area. The total area covers approximately 50 square blocks. This amounts to a density of about 10 dwelling units per block. The collection route length within the study area is 6.5 miles.

The residential collection crew picks up mostly domestic waste such as household garbage. They also collect yard trimmings and leaves if they are placed in bags, and other small amounts of rubbish. However, if the yard trimmings and rubbish amount to a large quantity they are left for the bulk waste collection trucks. Open burning of refuse is not allowed in Helena.

One collection crew serves the entire study area. All of the refuse generated by this area can normally be collected in one packer load.

Personal contact was made with every homeowner in the study area to discuss the objectives of the project, how it affected them, and to request their cooperation. An observation of each storage site was made to determine the site condition prior to placement of the new facilities.

The preliminary information collected on each individual refuse storage site included the number, type, and condition of the containers; the type and conditions of the existing racks; the littering and overall conditions of the storage site; and a picture of the site. A summary of the data taken is shown as Exhibit A in the appendix of this report.



The overall operation of the route was evaluated prior to installation of the new cans and racks. Periodic observation checks were made to determine the time required for the collection crew to serve the entire study area and also to check the weight of material collected from the area. The truck crew also recorded its own time and weight on the route in their daily records. A tabulation of the data from field checks on the crew is shown as Exhibit C in the appendix of this report. The route times for the three different survey observations were almost identical, although the total weight of refuse collected varied almost 4,220 pounds. The collection rate per man during the fall observation was 141 man minutes per ton compared to the winter observation when it was 125 man minutes per ton and the spring observation when it was 100 man minutes per ton. The crews' field records indicate an average collection rate of 132 man minutes per ton for the period from November, 1969 through May, 1970. This data, which was recorded by the collection crew working the route, covers 37 separate collection days throughout the period.

The crew members' records of 132 man minutes per ton compare favorably with the survey teams' observation time average of 122 man minutes per ton.

To select a garbage can rack most suitable for this area, existing racks in use around Helena and other cities were observed. The type of rack selected has a flip-top frame and holds two garbage cans. (See photos at end of this section.) Arrangements were made with Helena Industries, a non-profit corporation formed under the Model Cities Program, to construct and furnish these rack





and can combinations. Each completed unit, including two garbage cans, cost \$40.00, delivered to the City. Helena Industries supplied 218 completed units. All were placed in the residential study area by the end of November, 1970.

Those storage sites that had adequate racks and containers did not receive new units. A total of 190 homes received the new rack and can unit with some homes receiving more than one unit.

Racks and cans could not be used at homes with curb-side collection. For a six month experimental period these homes were supplied with plastic bags. On collection day the homeowners took the bags from their cans, securely tied the bags, and set them at curb-side for collection. Cans and racks were located off-street at a site selected by the homeowner. (See photos at end of this section.)

The plastic bags were supplied to the homeowners in convenient tear-off rolls of 25 or 50. Each bag had the City of Helena seal on it and the words "Help Keep Our City Clean". The plastic bags were .5 mils thick with an M.K.C. resin additive which supposedly added 30% more strength to the bag. Bags cost 6-1/2¢ each.

After contact was made with the homeowners to explain the project, 160 homes were issued the plastic bag liners during July, 1970. After December, 1970 no more bags were issued to the homeowners because of limitations on funds. In January, 1970 a questionnaire was sent to the homeowners who received the plastic bags. The results of the questionnaire are shown as



Exhibit B in the appendix.

The majority of the homeowners using the bags thought they were easier to use than cans, they improved the appearance of the neighborhood, and damage to bags from outside sources was minimal. The collection crew indicated the bags that were broken at curb-side were caused by dogs, broken glass in the bags, or by homeowners ripping the bags when they pulled them out of their garbage cans. The crews also felt that the dog problems were caused by garbage that was accidentally spilled.

During field checks of the collection crews it was observed that crew efficiency was improved with the use of plastic bags. The pickup men previously had to carry the garbage can from the curb to the truck and return the can to the curb. However, since only approximately 160 homes in the study area received plastic bag liners, it is impossible to make any usable correlations between improved crew efficiencies and plastic bag usage.

By the end of November, 1970 all of the new residential container and rack units were placed in the residential study area. Field observations were made to determine if any changes had occurred in the efficiencies of the collection crew that could be attributed to the replacement of the old garbage cans and racks with the new units. Two field observations were made, one on December 1, 1970 and one on March 5, 1971. (See Exhibit C in the appendix) The average collection rate of the crew was 147 man minutes

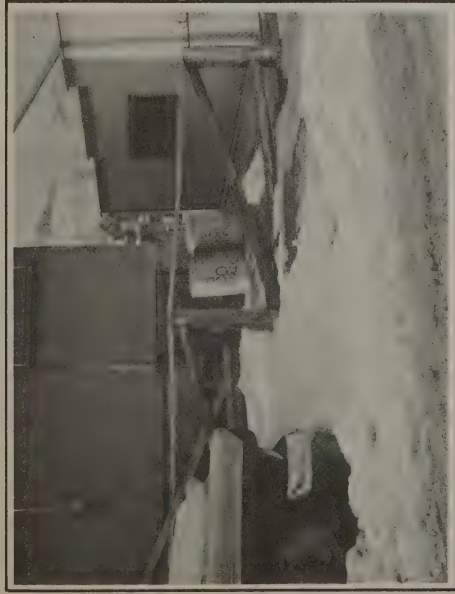




per ton. This is an increase from the rate of 122 man minutes per ton average figured prior to placement of the new containers. More field observations will be taken during the third year of the study and the efficiencies may change some during this period. However, preliminary results indicate that with the new container-rack units it is taking the men longer to collect refuse than it did with the old substandard containers. One reason for this is that the collectors are replacing the cans in the racks and placing the lids down on the containers. Many of the old substandard units did not have lids or racks. The additional time required to return a container to a rack and flip the lid down on top of it is offset by the improvements to the appearance and overall sanitation of the area. Improvements to the esthetics of the area are shown in the "before" and "after" photos at the end of this section.

A questionnaire mailed to the homeowners in the study area revealed that the residential rack and can units are performing well. The maintenance problems are few and the general appearance of the storage sites has improved. The tabulated results of the questionnaire are included as Exhibit D in the appendix of this report.

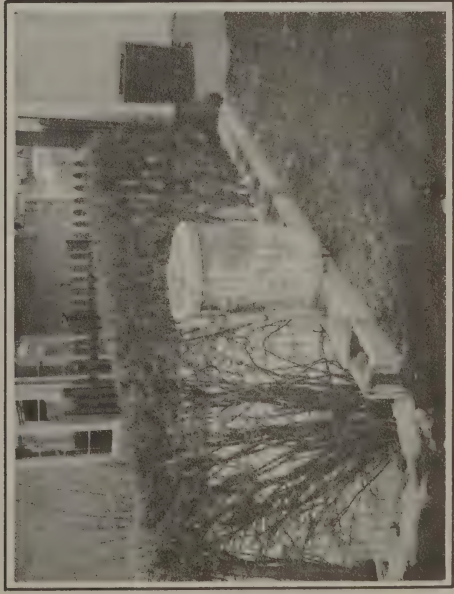




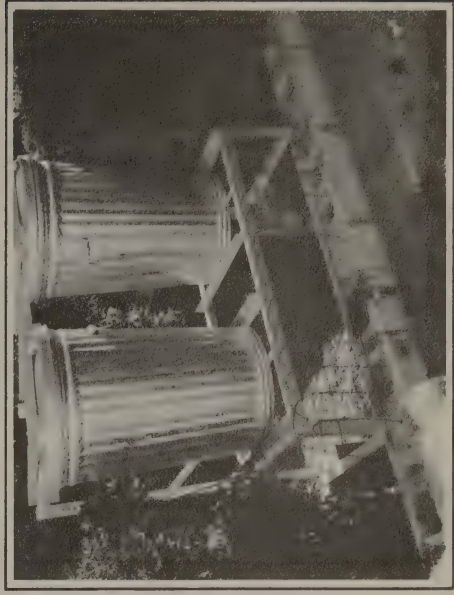
Residential storage area prior to study



Residential rack and can placement at same location



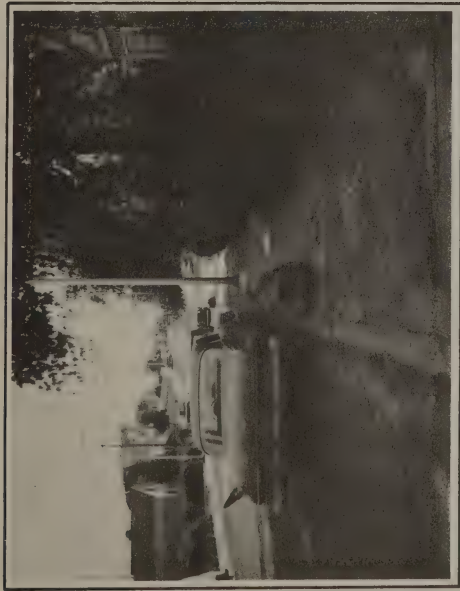
Residential storage area prior to study



Residential rack and can placement at same location







Curb-side placement of plastic bag containers



Plastic bag container torn open by dog



Curb-side placement of plastic bag container



Curb-side placement of container prior to study



#### SECTION IV - COMMERCIAL STORAGE

A survey was conducted on the collection times required to pick up the refuse at each commercial storage site in Helena. Following this survey 68 commercial storage sites were selected to receive one or two cubic yard bulk containers in place of the 32 or 55 gallon containers that were being used.

A summary of the initial collection route data for the commercial observation area is shown in the appendix of this report. This data was taken when few bulk containers were being used in Helena. The route referred to as the night route was covered by a collection crew working from 5:00 P.M. until after midnight. The evening crew worked from 3:30 P.M. until late in the evening. Both routes served different storage sites with some overlapping of area depending on pickup frequency required per storage site. Actual field check observations were made on the crews during the fall, winter, and spring, as indicated by the summary sheet. Detailed data was kept for all operations for each collection route. For each commercial storage site, stop watch timings were recorded from the time the collectors stepped off the truck to pick up the refuse until they stepped back on the truck. The number of 32 or 55 gallon containers emptied and the number of hand loads was also recorded. This data was used in selecting those commercial sites to receive bulk containers.

It takes a minimum of one minute to collect a bulk container from the time the truck stops at the site until it leaves the site. One of the criteria for a bulk container site was that it required more than one minute to collect the





existing 32 or 55 gallon containers. The sanitation and the esthetics of the storage sites was also considered. (See photos at end of section.) It was impossible to place bulk containers at some sites because of the limited space.

A total of 68 bulk containers were placed between July, 1970 and December 1, 1970. Following the installation of the units, field observations were made to determine the effect on esthetics, sanitation, and collection time.

This year the commercial collection has been reduced to one route. The new route handles mostly commercial collections whereas the original two routes also collected residential refuse.

The "Commercial Observation Area Initial Data Summary" and the "Commercial Observation Area Final Data Summary" sheets are shown as Exhibit E in the appendix of this report. One wintertime survey has been completed on the bulk container sites. More observations will have to be made this year to substantiate the data obtained.

By averaging the initial data for the two commercial routes and adding it together, the following route comparisons can be made with the new route now in use. The total number of commercial sites served by the new route has decreased from 237 to 177. Some of the storage sites originally assigned to the commercial crews are not being collected by the bulky waste collection trucks. Residential storage sites being collected decreased from 64 to 14. The installation of bulk containers has reduced the 32 and 55 gallon containers from 543 to 188. The number of bulk containers has increased from 13 to 69. There were no bulk containers in use in Helena prior to initiation of this project



but at the time of the initial survey some bulk containers had been installed because of the urgent need. Some businesses purchased their own bulk containers as soon as the City installed the lift equipment on the collection vehicles.

Prior to placement of the bulk containers at commercial sites, there was an average of 1341 hand loads. (Refuse such as boxes, bags, excluding garbage cans carried by a collector to the truck hopper from the storage site) There are now 625 hand loads. Before bulk containers were installed there were 92 storage sites that took longer than one minute to collect. On March 4, 1971 there were 74. The average total route length of the two commercial routes, before bulk container placement, was 26 miles compared to 21.6 miles for the one route now serving the area.

The total weight of all refuse collected by the two trucks before bulk containers, averaged 24,000 pounds. The one commercial route now averages 18,050 pounds.

The average collection rate has decreased from 140 man minutes per ton to 116 man minutes per ton during the March, 1971 observation. More timings are needed in this year's study to substantiate these findings.

"The Bulk Container Time Survey Summary" is shown as Exhibit F in the appendix of this report. This summary sheet indicates the names of each commercial site receiving a bulk container. Some of the sites that do not have preliminary timings were issued bulk containers under the study because there was a definite need. Construction of some apartment houses and buildings





was being completed at the time of the bulk container placement. The locations that met the placement criteria received bulk containers without prior timings.

Those sites that had "before" and "after" timings were totaled and the results indicate that pickup time was reduced by 33%.

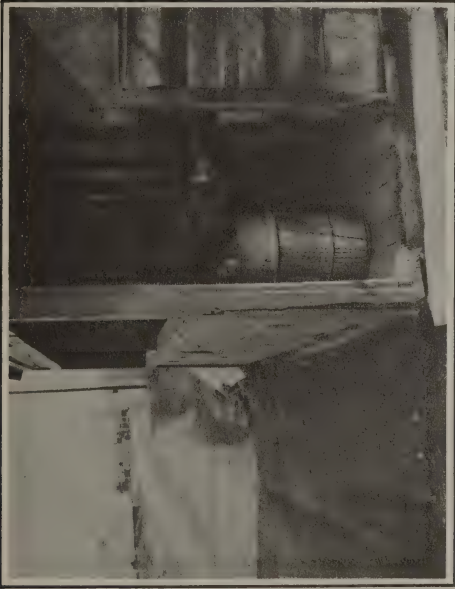
The pickup time amounts to about 60% of the total time spent collecting refuse on the route. Route time does not include haul time spent while taking a load of refuse to the landfill or traveling to and from the shop in the morning or evening. Since the pickup time amounts to 60% of the route time, a 33% reduction in the pickup time gives an overall reduction in route time of 20%.

The esthetics and sanitation of the sites has also improved due to the bulk container placement. At the end of this section are "before" and "after" pictures of the storage sites, which indicate how the overall site conditions can improve. Dumped over garbage cans, loss of garbage can lids, spilled garbage, and unsightly messes have to a large extent been eliminated.

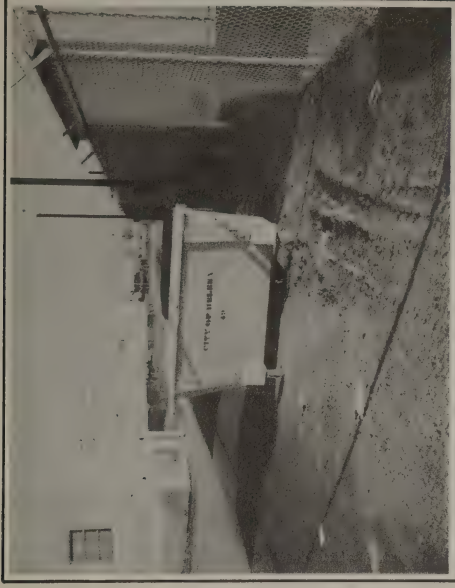
Some of the firms are still not placing all of their refuse in the bulk containers. Cardboard boxes which require crushing before placing them in the containers are often piled beside the units.

This year a 20 cubic yard collection vehicle was purchased to replace the 16 cubic yard unit. The new unit has a larger hopper which has helped to improve the collection time. The packer mechanism on the older truck often had to empty a full cubic yard bulk container.





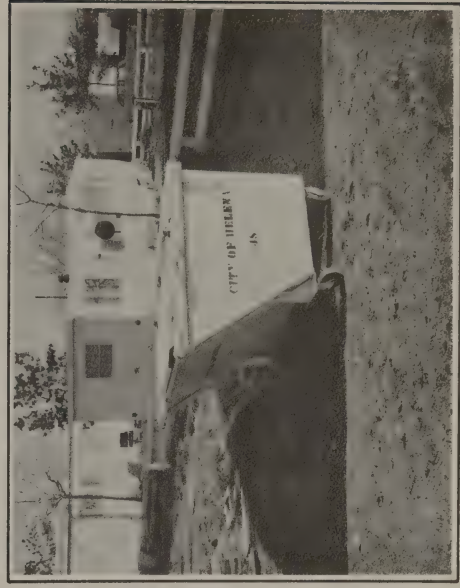
Commercial storage area prior to study



Bulk container placement at same location

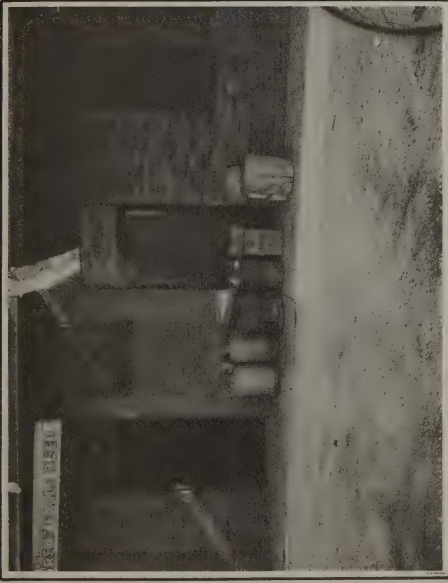


Commercial storage area prior to study

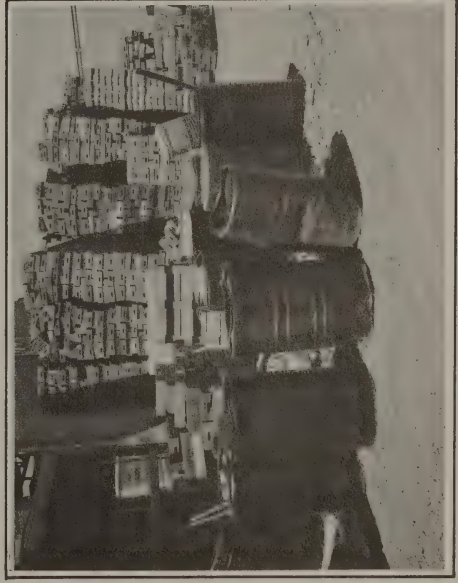


Bulk container placement at same location





Commercial storage area prior to study



Commercial storage area prior to study



Bulk container placement at same location



Bulk container placement at same location





## SECTION V - DISPOSAL FACILITIES

The landfill disposal site used by the Helena area until October of 1970 was located approximately 2-1/2 miles northeast of the city center. An old gravel pit was being used for burying rubbish and the surrounding area was used for disposal of garbage and other waste. The trench method of disposal was used for burying the refuse.

A new sanitary landfill site in operation since October, 1970 is located in Helena approximately 1/2 mile north of the downtown area. (See photos at end of section). This site was selected because of the location and the opportunity of reclaiming the land. The old landfill site is no longer being used. Lewis & Clark County has opened another site to serve rural people who were using the City's old site.

Weigh scales were installed at the old site in 1969, to determine the amount of refuse. Below are listed the total refuse weights per month delivered to each site and that portion of the total that was hauled there by the City collection vehicles.

	REFUSE TO OLD LANDFILL (tons) *											
	1969		1970									Avg. Month
	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.		
TOTAL AMOUNT REC'D	1310	1213	1169	1040	1536	1830	2363	1658	2438	2250	1681	
AMOUNT COLLECTED	749	889	774	691	918	957	1050	938	989	1063	902	

\*Note - September, 1970 is not included because landfill sites were changed during the month.



	REFUSE TO NEW LANDFILL (tons)						
	1970			1971			Avg. Month
	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	
TOTAL AMOUNT RECEIVED	3180	1293	1465	1172	1138	1167	1569
AMOUNT COLLECTED	1087	796	976	831	781	886	893

Refuse records can be compared for the common period of November through March for the past two years. The average collected was 804 tons per month the first year and 854 tons per month the second year. The total tons per month was 1253 for the first year and 1247 for the second year. The duration of these records is too short to draw any definite conclusions. It appears that increased volumes within the City have been offset by a decrease in the amount of refuse coming from outside the City. Records for both indicate that volumes were lower during the winter months.

The type of material disposed of at the new site compares with that of the old site with one exception. Helena has an Urban Renewal Project which sends demolition debris to the new landfill site. This material is not included in the weight totals. All commercial, residential, and bulky wastes are disposed of at the new site. Dead animals are disposed of by the Helena Animal Shelter.

The refuse disposed of at the old landfill site consisted primarily of residential, commercial, and bulky waste. Amounts of industrial waste for this area were considered negligible.





The City of Helena estimated that 10-20% of the total waste brought to the old landfill site came from residents outside the City limits of Helena. The other refuse was either hauled by City collection vehicles or by the homeowners living within the City limits.

The changeover from the old landfill site to the new site took place during September of 1970. The total refuse collected by the City crews from November, 1969 through August, 1970 was 9,020 tons for residential, commercial, and bulky waste. The population of Helena from the 1970 census is 22,730. An average of 2.60 pounds per capita per day was collected by the Helena crews. The landfill received 4.85 pounds per capita per day. From October, 1970 through March, 1971 the rates were 2.58 pounds per capita per day collected and 4.54 processed at the landfill. The decrease in the total being received would indicate that less refuse is being received from outside the City.

A breakdown of the solid waste disposed of at each landfill site by the City of Helena is given below:

COLLECTED REFUSE  
Average Monthly Tonnage (May - August, 1970)

Residential	Commercial	Bulky Waste
525	297	189
52% of total	29% of total	19% of total

Average Monthly Tonnage (Oct., 1970 - March, 1971)

590	169	118
67% of total	19% of total	14% of total



Since the breakdown of the type of refuse has been recorded for less than one year, no definite conclusion can be made. The increase in the percentage of residential refuse is most likely due to the reorganization of the commercial and bulky waste collections crews to eliminate residential areas from their routes.

People living outside of the City are charged for use of the disposal facilities in accordance with the following schedule:

Car load	\$0.50
Pickup Load	\$1.00
Trucks over 1 ton	\$2.00
Commercial rate	\$2.50/ton

Winter hours for the site were 8:00 A.M. to 5:00 P.M. daily, and during the summer 8:00 A.M. to 8:00 P.M. daily. After hours the site was closed and locked. A bulk container was placed outside the gate for after hour deposits.

An ordinance enforced during 1969 eliminated all types of burning at sanitary landfills.

The new landfill is open from 9:00 A.M. to 6:00 P.M. Monday through Friday, from 10:00 A.M. to 4:00 P.M. on Saturday, and is closed Sunday during the winter. Summer hours will be 9:00 A.M. to 8:00 P.M. Monday through Saturday and closed on Sunday.

The purpose of using this site was to reclaim a portion of land that was previously a low drainage area and to shorten the collection vehicle haul



distance. A 66 inch diameter reinforced concrete pipe was installed through the bottom of the new landfill site. The installation included a clay seal over the top of the pipe to prevent water from infiltrating through the landfill waste into the pipe. (See photos at end of section.)

A new truck scale and scalehouse was completed in the fall of 1970. The scale is an L. R. Murphy scale and has a 30 ton capacity. The scalehouse includes bathroom facilities and a small amount of storage area for landfill maintenance tools and equipment. (See photos at end of section.)

For many years fill dirt and rubble have been deposited in the low areas of the new landfill site. Test holes dug around the site indicated that the deposited material could be used for cover soil. It consisted mostly of clay and silt with a small amount of gravel. This material has proved adequate for cover soil.

The trench method type of fill is now being used at the north end of the site where the previous fill dirt was deposited. Prevailing winds caused some problems with the first trench orientation. However, by re-orienting the trench perpendicular to the prevailing winds, the problem has been held to a minimum. Portable fence units are utilized to control paper blowing. These units are placed side by side to provide a 10 foot high fence along the trench. (See photos at end of section.) In addition a snow fence encloses the entire area to help trap blowing debris.

Equipment used at the landfill consists of a D-7 Cat equipped with a dozer and a cable scraper. A 72-40 Euclid front end loader equipped with a 3 yard





4-in-1 bucket with fortified tires is used to place and compost earth cover.

Recently an order was placed for a wheel compactor unit for use in compacting the refuse.

The location of the new landfill site is two miles closer to the downtown area of Helena than was the old site. When the new landfill was put into operation the collection routes were changed to better utilize the new location. An average haul cost per ton for the ten month period prior to changeover to the new landfill site was \$4.07 per ton. After the new landfill was placed into operation the haul cost per ton dropped to \$3.36, or a decrease of approximately 18%.

There has been an increase in the number of attendants required at the new site because of increased hours the scales are operated and extra care taken to keep the area clean. One additional attendant is required in the winter and two in the summer. There has been no change in the number of equipment operators (2) working at the site.

The cost to operate the new landfill has increased over that of the old site. Average costs for disposal have increased from \$1.47 per ton to \$2.27 per ton. The tons disposed per manhour has been decreased from 2.3 to 1.7.

Because of the variable soil conditions at the site the amount of movement of any gas generated by the refuse is difficult to predict. A study on gas movement in sanitary landfills, conducted in Los Angeles County, 1967-1969, attempted to determine a correlation between direction and extent of gas movement and soil characteristics. They determined that if the soils are



composed of fine clay and silt material, with adequate moisture, they probably will provide a natural barrier to gas movement. The soil fill previously deposited at the new landfill is now being used as cover material for the refuse buried there. If this material is compacted over the cells of refuse, it seems that gas flow would rise up through the cells to the surface before it would travel horizontally through the undisturbed material surrounding the site. There are several buildings approximately 150 feet from the nearest landfill operation and it would be a good precautionary measure to develop a gas monitoring program for these areas. This monitoring program could be performed using equipment of the type used by gas distribution utilities. Methane gas production and movement can be detected by testing bar holes in the upper soils adjacent to the landfill. If gases are found a more detailed study of the landfill and surrounding area should be made to determine the extent of gas movement and to evaluate the possible hazards. As a further precaution, structures in the area should be ventilated to prevent accumulation of gases.







Concrete pipe drain installed through landfill site



Completed clay seal over drain pipe at landfill



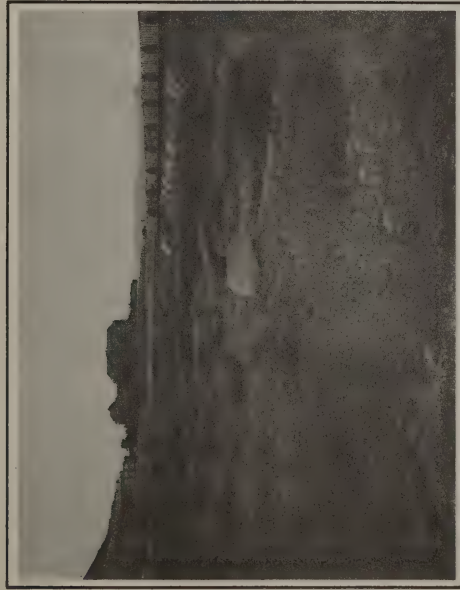
New scalehouse and restroom facility at landfill



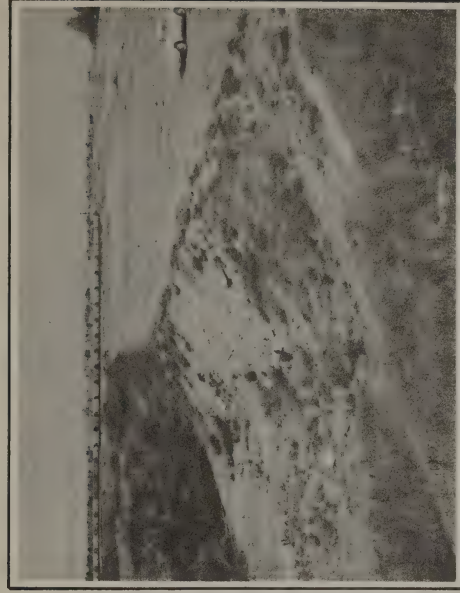
Portable fence units for controlling blowing papers  
at new landfill operation



# NEW SANITARY LANDFILL SITE



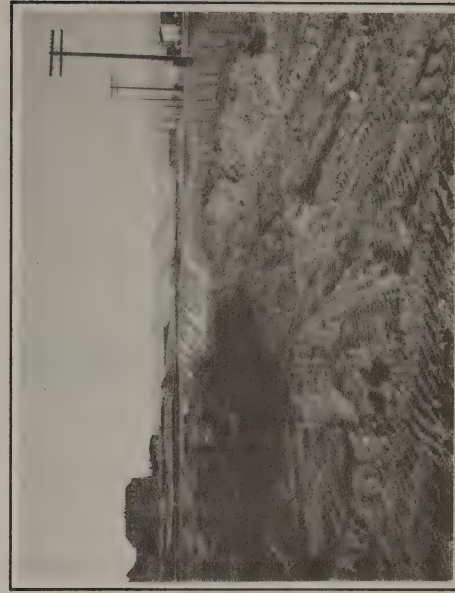
Looking west from northeast corner of new landfill site



Looking north along centerline of new landfill site



Looking west from northeast corner of new landfill with fill operation in process



Looking west from northeast corner of new landfill with cover soil over one lift of compacted refuse



## SECTION VI- PROJECT COST ACCOUNTING

A cost accounting system was initiated at the beginning of the project in June of 1969 to provide an economic evaluation of changes in operation. The cost accounting system is in accordance with guide lines proposed by the U.S. Public Health Service. The accounting system was expanded this last year to provide additional information. There are eleven different forms now being used and a sample of each is shown in the appendix of this report.

The forms used are self explanatory for the most part. Form #1 "Weekly Labor Ticket" is completed daily by the Sanitation Department Superintendent, Mr. Don Lewis, and indicates the total hours worked by each employee.

Form #2 "Daily Truck Weight Record" is completed daily by the scale operator at the landfill site. This record is an indication of the type of refuse brought to the landfill and whether it is a city vehicle or other type. At the bottom of this sheet is recorded the total hours per day that the landfill equipment is in use.

Form #3 is completed by the driver of each collection vehicle. At the top of this form is recorded the time and truck mileage when the truck leaves the shop in the morning and returns in the afternoon. The time start and time finish at the bottom of the form is recorded when the actual collection phase of the route is started and ended. This is an indication of the actual time spent collecting refuse.

Form #4 "Complaint Notice" is completed by the Superintendent when he receives a legitimate complaint from a homeowner.





Form #5 "Daily Repair and Maintenance Record" is completed daily by the maintenance department for all sanitation vehicles. This provides a record of all vehicle maintenance and repair costs.

Form #6 "Crew Performance Evaluation" is completed weekly using data collected daily on forms #1, #2, and #3. The superintendent completes this form.

Form #7, "Operating Cost Summary", has been expanded over that used at the beginning of this project. This form is a cost summary sheet completed monthly by the superintendent. It is very detailed and uses data from forms #1, #2, #3, #5, #6, and #8. A detailed explanation of this form is outlined later in this report.

Form #8, "Monthly Vehicle Performance Evaluation" is completed monthly by the superintendent of the Department of Sanitation. Data collected includes the individual and total costs of operation and maintenance for all the department vehicles.

The City Accounting Department completes form #9 and #10 on equipment and facility inventory. Depreciation of equipment and facilities is indicated on these forms.

The annual "Total Collection Cost Summary" Form #11 is completed by the Accounting Department at the end of each three month period. Total operating and depreciation costs are computed on this form.

Form #7 "Monthly Operating Cost Summary" and #11 "Total Collection Cost Summary" summarize the data collected on the other forms. Below are tabulated



the averages of the monthly values now being computed on the new form #7.

MONTHLY OPERATING COST SUMMARY (Average of Monthly Values)

Collection & Haul Operations :		Residential	Commercial	Bulky Waste
	Factor	\$ or amount	\$ or amount	\$ or amount
Route	Cost/Ton	\$9.68	\$8.57	\$15.46
Service	% Time on Route	73%	73%	70%
Cost	Man Minutes/Ton	146	134	244
<u>Center</u>				
Hauling	Cost/Ton	\$4.07	\$3.53	\$7.42
Cost Center	Tons/Equip. Hr.	3.46	3.64	1.26
Repair &	Cost/Ton	\$0.71	\$0.71	\$0.52
Maintenance	Cost/Equip. Hr.	\$0.60	\$0.82	\$0.15
Cost	Parts Cost	\$257.84	\$70.86	\$7.17
Center	% Time Equip. Down	6.2%	5.1%	2.8%
<u>Collection &amp; Haul</u>				
	Tons Collected	587	165	111
	Total Cost	\$8,358.00	\$2,111.00	\$2,548.00
Totals	Total Cost/Ton	\$14.46	\$12.79	\$23.41

Disposal Operations		Total
	Factor	Tonnage
Disposal	Cost/Ton	\$ 1.94
Cost	Total Tons to Landfill	1258
Center	Tons Disposed/Labor Hr.	1.9
	Tons Disposed/Equip. Hr.	3.8
Disposal &	Cost/Ton	\$ 0.27
Repair Maint.	Cost/Equip. Hr.	\$ 1.07
Cost	Parts Cost	\$212.00
Center	% Time Equip. Down	8%
	TOTAL COST/TON	\$2.23

Collection & Haul Total \$13,017.00

Disposal Total \$ 2,757.00

GRAND TOTAL \$15,774.00

Depreciation costs are not figured in form #7 costs above. Form #11 "Total Collection Cost Summary" includes the depreciation values as shown below.



Residential Collection		
Operating Cost per Ton		\$14.25
Depreciation Cost per Ton		\$ 0.81
Total Cost per Ton		\$15.06
Commercial Collection		
Operating Cost per Ton		\$12.77
Depreciation Cost per Ton		\$ 1.06
Total Cost per Ton		\$13.83
Bulky Waste Collection		
Operating Cost per Ton		\$23.02
Depreciation Cost per Ton		\$ 1.90
Total Cost per Ton		\$24.92
Disposal		
Operating Cost per Ton		\$ 2.19
Depreciation Cost per Ton		\$ 0.46
Total Cost per Ton		\$ 2.65
Overall Refuse Operation		
Operating Cost per Ton		\$18.29
Depreciation Cost per Ton		\$ 1.67
Total Cost per Ton		\$19.96

The above collection figures are based on the tons of refuse collected, and the disposal costs are based on the tonnage delivered to the landfill site.

An outline explanation is given below of the steps required to complete Form #7. A copy of Form #7 is shown with Roman numerals after each item listed. The Roman numerals indicate the section in the outline explanation describing the procedure used to compute that figure.

On Form #7 the Route Service Cost Center pertains to those costs directly related to the actual collection phase of the routes when the crews empty the refuse containers. The Hauling Cost Center deals only with the costs of hauling the refuse from the routes to the landfill. The Repairs and Maintenance Cost Center are for the collection vehicles only (Excludes disposal equipment). Each cost center is





broken down further into Residential, Commercial, and Bulky Waste Sections.

Disposal or landfill operations are separated into the Disposal Cost Center and the Repairs and Maintenance Cost Center. All repair and maintenance costs on disposal equipment are included here under Disposal Operations to keep them separate from the Collection and Haul Operations. Collection and Haul Totals are kept separate from the Disposal Totals.

#### MONTHLY OPERATING COST SUMMARY

Collection & Haul Operations	Factor	Residential \$ or Amount	Commercial \$ or Amount	Bulky Waste \$ or Amount
Route Service	Cost/Ton	I	II	III
Cost	% Time on Route	IV	V	VI
Center	Man Minutes/Ton	VII	VIII	IX
Hauling	Cost/Ton	X	XI	XII
Cost Center	Tons/Equip. Hr.	XIII	XIV	XV
Repair & Maintenance	Cost/Ton	XVI	XVII	XVIII
Cost	Cost/Equip. Hr.	XIX	XX	XXI
Center	Parts Cost	XXII	XXIII	XXIV
	% Time Equip. Down	XXV	XXVI	XXVII
Collection & Haul	Tons Collected	XXVIII	XXIX	XXX
	Total Cost	XXXI	XXXII	XXXIII
Totals	Total Cost/Ton	XXXIV	XXXV	XXXVI

Disposal Operations	Factor	Total Tonnage		
Disposal	Cost/Ton	XXXVII	Collection & Haul	
Cost	Total Tons to Landfill	XXXVIII	TOTAL	XXXXVI
Center	Tons Disposed/Labor			
	Hr.	XXXIX		
	Tons Disposed/Equip.			
	Hr.	XXXX	Disposal	
Disposal	Cost/Ton	XXXXI	TOTAL	XXXXVII
Repair & Maintenance	Cost/Equip. Hr.	XXXXII		
Cost	Parts Cost	XXXXIII		
	% Time Equip.			
	Down	XXXXIV		
	TOTAL COST/Ton	XXXXV	GRAND TOTAL	XXXXVIII



## MONTHLY OPERATING COST SUMMARY OUTLINE

### ROUTE SERVICE COST CENTER

#### I Residential Cost/Ton (Exclude all commercial and bulky waste costs)

- a) Labor costs (LC) - direct wages, overtime pay and fringe benefits (vacation pay, group life, medical insurance, social security payments and pension contributions) (Form #1)

$$LC = (\% \text{ time on route from IV}) \times (\text{Residential collection labor costs} = \underline{\hspace{2cm}})$$

- b) Operation = Oil, lube & gas costs (Op.)

$$Op. = (\% \text{ time on route from IV}) \times (\text{Residential truck fuel, oil and lube costs}) (\text{Form \#8}) = \underline{\hspace{2cm}}$$

- c) Overhead costs: Supervision (Superintendent salary, foreman's salary, car costs for both men) administrative, dept. charges such as payroll costs, accounting costs and any other miscellaneous overhead items. Proportion according to number of employees in Residential route service cost center. See Example A below.

$$(\text{Overhead cost}) \times (\text{Proportioned } \%) = \underline{\hspace{2cm}}$$

$$\text{TOTAL COST} = a + b + c \quad \quad \quad = \underline{\underline{\hspace{2cm}}}$$

- d) Total tons: Total tons collected by City residential trucks as taken from Form #2

$$\text{Residential Cost/Ton} = \frac{\text{Total cost from I "a + b + c" above}}{\text{Total tonnage from "d" above}}$$

#### Example A      OVERHEAD PROPORTIONING

	<u>No. of employees</u>		<u>*Proportioned %</u>
Route Service Cost Center			
Residential employees	12	12/47=	25%
Commercial employees	3	3/47=	7%
Bulky Waste employees	4	4/47=	9%
Hauling Cost Center			
Residential employees	12	12/47=	25%
Commercial employees	3	3/47=	7%
Bulky Waste employees	4	4/47=	9%
Repairs and Maintenance - Estimate			
R & M employees used for coll. & haul vehicles			
Residential trucks	2	2/47=	5%
Commercial trucks	1	1/47=	1%
Bulky Waste trucks	1	1/47=	1%

(continued next page)



	<u>No. of employees</u>	<u>*Proportioned %</u>
Disposal Cost Center		
Landfill employees	4	4/47
Repair and Maintenance - Est. R&M employees used for disposal equip. 1	1/47	<u>2%</u>
		100% Must = 100%

\* Keep constant each month and review figures annually.

II Commercial Cost/Ton (City trucks only) (Exclude all residential and bulky waste costs)

Repeat I above using commercial labor costs (Form #1), commercial truck operation costs (Form #8) and overhead amount in proportion to commercial crew members. See V for commercial % time on route. Total tonnage for City commercial trucks taken from Form #2. Cost/ton divided as per I above.

III Bulky Waste Cost/Ton (City Trucks only) (Exclude all residential and commercial costs)

Repeat I using bulky waste truck labor costs (Form #1), operation costs for bulky waste trucks (Form #8) and overhead amount in proportion to bulky waste crew members. See VI for bulky waste % time on route. Total tonnage separated out for tramp trucks (Form #2). Cost/ton divided as per I above.

IV Residential % Time on Route

$$= \frac{\text{monthly truck hours on route for residential crews (Form \#3)}}{\text{monthly total residential truck hours (Form \#3)}}$$

V Commercial % Time on Route

Repeat IV using commercial route and truck times (Form #3)

VI Bulky Waste % Time on Route

Repeat IV using tramp truck route and truck times (Form #3)

VII Residential Man Minutes/Ton:

$$= \frac{(\text{monthly truck hrs. on route for residential crews}) (60 \text{ min/hr}) (\text{No. of crew members})^{***}}{\text{Total tons collected by residential trucks}^{**}}$$

\* Get from IV above

\*\* Get from I d above

\*\*\* Three for residential trucks - always include driver.





### VIII Commercial Man Minutes /Ton

Repeat VII using data used in V and II above

### IX Bulky Waste Man Minutes/Ton

Repeat VII using data used in VI and III above. Be careful here to use only 2 crew members for tramp trucks if applicable.

### HAULING COST CENTER

#### X Residential Cost/Ton

- a) Labor Costs (LC) - Direct wages, overtime pay and fringe benefits (Form #1). Same as computed in Ia above

% time truck on haul = 100% - Residential % time on route from IV

L.C. = (% time truck on haul) x (Residential collection labor costs) = \_\_\_\_\_

- b) Operation = oil, lube and gas costs (Op)

Op = (% time on haul from Xa) x (Residential truck fuel, oil and lube costs from Ib) = \_\_\_\_\_

- c) Overhead = Proportion according to number of employees in Residential Hauling Cost Center. See Ic.

(Overhead cost) x (Residential Haul Proportioned %) = \_\_\_\_\_

TOTAL COST = a + b + c = \_\_\_\_\_

- d) Total tons: Total tons collected by City residential trucks as taken from Form #2 and shown in Id.

Residential Cost/Ton =  $\frac{\text{total cost from X a + b + c above}}{\text{total tonnage from Xd above}}$

#### XI Commercial Cost/Ton

Repeat X above using commercial labor costs IIa, commercial truck operation costs IIb and overhead amount in proportion to commercial haul crew members. Compute % time truck on haul by subtracting % route time V from 100%. Total tonnage for City commercial trucks same as in II. Cost/ton divided as in X above.



## XII Bulky Waste Cost/Ton

Repeat X using bulky waste labor costs IIIa, bulky waste truck operation costs IIIb, and overhead amount in proportion to bulky waste haul crew members. Compute % time truck on haul by subtracting % route time VI from 100%. Total tonnage for City tramp trucks same as in III. Cost/ton divided as in X above.

## XIII Residential Tons/Equipment Hours

= Total residential tons collected (Id)  
Total hours truck on haul - compute from IV

100% - % time on route = % time on haul.

## XIV Commercial Tons/Equipment Hours

= Total commercial tons collected (IIId)  
Total hours truck on haul - compute from V

## XV Bulky Waste Tons/Equipment Hours

= Total tramp truck tons collected (IIIId)  
Total hours truck on haul - Compute from VI

## REPAIRS AND MAINTENANCE COST CENTER

## XVI Residential Cost/Ton

- a) Labor and parts cost for residential trucks can be taken directly off Form #5. Include fringe benefit costs in Form #5 for mechanics. \_\_\_\_\_
- b) Overhead costs should be proportioned as per no. of employees in R & M cost center as per Ic, example A. \_\_\_\_\_
- c) Total tons: Total residential truck tonnage Id \_\_\_\_\_

Residential Cost/Ton = total cost from XVI a + b above  
total tonnage from Id

## XVII Commercial Cost/Ton

Repeat XVI using commercial truck data from Form #5 and overhead costs proportioned as per Ic Example A. Truck tonnage as per IIId. Divide cost/ton as in XVI above.



### XVIII Bulky Waste Cost/Ton

Repeat XVI using bulky waste data from Form #5 and overhead costs proportioned as per Ic Example A. Truck tonnage as per IIId. Divide cost/ton as in XVI above.

### XIX Residential Cost/Equipment Hours

$$= \frac{\text{Total cost from XVI a + b}}{\text{Total hours residential equipment in use/month (Form \#3)}}$$

### XX Commercial Cost/Equipment Hours

$$= \frac{\text{Total cost from XVII a + b}}{\text{Total hours commercial equipment in use/month (Form \#3)}}$$

### XXI Bulky Waste Cost/Equipment Hours

$$= \frac{\text{Total cost from XVIII a + b}}{\text{Total hours bulky waste equipment in use/month (Form \#3)}}$$

### XXII Residential Parts Cost - Take directly from Form #5

### XXIII Commercial Parts Cost - Take directly from Form #5

### XXIV Bulky Waste Parts Cost - Take directly from Form #5

### XXV Residential % of Time Equipment Down

$$= \frac{\text{Total hours residential equipment down - per month from Form \#5}}{\text{Total residential truck hours as in IV}}$$

### XXVI Commercial % Time Equipment Down

$$= \frac{\text{Total hours commercial equipment down - per month from Form \#5}}{\text{Total commercial truck hours as in V}}$$

### XXVII Bulky Waste % Time Equipment Down

$$= \frac{\text{Total hours bulky waste equipment down per month from Form \#5}}{\text{Total bulky waste truck hours as in VI}}$$





## COLLECTION AND HAUL TOTALS

XXVIII Residential Tons Collected - Take directly from Form #2 for City residential trucks only. This amount should equal that in Id.

XXIX Commercial Tons Collected - Take directly from Form #2 for City commercial trucks only as in IID.

XXX Bulky Waste Tons Collected - Take directly from Form #2 for City bulky waste trucks only as in IIId.

XXXI Total Cost (Residential) - Depreciation is not included here so this is total of I a + b + c plus X a + b + c plus XVI a + b.

XXXII Total Cost (Commercial) - Total of II a + b + c plus XI a + b + c plus XVII a + b.

XXXIII Total Cost (Bulky Waste) - Total of III a + b + c plus XII a + b + c plus XVIII a + b.

XXXIV Total Cost/Ton (Residential) =  $\frac{\text{Total Cost from XXXI}}{\text{Tons Collected from XXVIII}}$

XXXV Total Cost/Ton (Commercial) =  $\frac{\text{Total Cost from XXXII}}{\text{Tons Collected from XXIX}}$

XXXVI Total Cost/Ton (Bulky Waste) =  $\frac{\text{Total Cost from XXXIII}}{\text{Tons Collected from XXX}}$

## DISPOSAL COST CENTER

### XXXVII Cost/Ton

- a) Labor Costs - direct wages, overtime pay and fringe benefit pay (Form #1) Scaleman, landfill equipment operators, etc. \_\_\_\_\_
- b) Operation - Oil, lube and fuel costs for landfill equipment only (Form #8) \_\_\_\_\_
- c) Overhead costs - proportion according to number of employees at disposal site - See Ic Example A \_\_\_\_\_

TOTAL COST a + b + c = \_\_\_\_\_



- d) Total tons: Total all refuse tonnage disposed at landfill including out-of-town refuse. Form #2

$$\text{Disposal Site Cost/Ton} = \frac{\text{Total cost from XXXVII a + b + c}}{\text{Total tonnage from XXXVII d}}$$

XXXVIII Total tons to landfill - Copy from XXXVII d.

XXXIX Ton Disposed /Labor Hours

$$= \frac{\text{Tons disposed @ landfill from XXXVIII}}{\text{Total landfill labor hours Form \#1}}$$

XXXX Tons Disposed/Equipment Hours

$$= \frac{\text{Tons disposed @ landfill from XXXVIII}}{\text{Total landfill equipment hours Form \#2}}$$

DISPOSAL REPAIRS AND MAINTENANCE COST CENTER

XXXXI Cost/Ton

- a) Labor and parts cost for scale and disposal site equipment can be taken directly off Form #5. \_\_\_\_\_
- b) Overhead costs should be proportioned as per Ic Example A \_\_\_\_\_  
TOTAL COST = a + b \_\_\_\_\_
- c) Total tons taken from XXXVIII

$$\text{R \& M Cost/Ton} = \frac{\text{Total Cost a + b above}}{\text{Total tons c above}}$$

XXXXII Cost/Equipment Hours

$$= \frac{\text{Total Cost as in XXXXI a + b}}{\text{Total landfill equipment hours (Form \#2)}}$$

XXXXIII Parts Cost - Take directly from Form #5 for disposal equipment.

XXXXIV % of Time Equipment Down.

$$= \frac{\text{Total hours disposal equipment down per month from Form \#2, \#5, or \#8}}{\text{Total disposal equipment hours per month from Form \#2}}$$



XXXXV Total Cost/Ton

= Total Cost from XXXVII a + b + c plus XXXXI a + b  
Total tons taken from XXXVIII which should equal  
the sum of XXXVI + XXXXI

XXXXVI Collection & Haul Total - Total of XXXI + XXXII + XXXIII

XXXXVII Disposal Total - Total of XXXVII a + b + c plus XXXXI a + b

XXXXVIII Grand Total - Total of XXXXVI plus XXXXVII

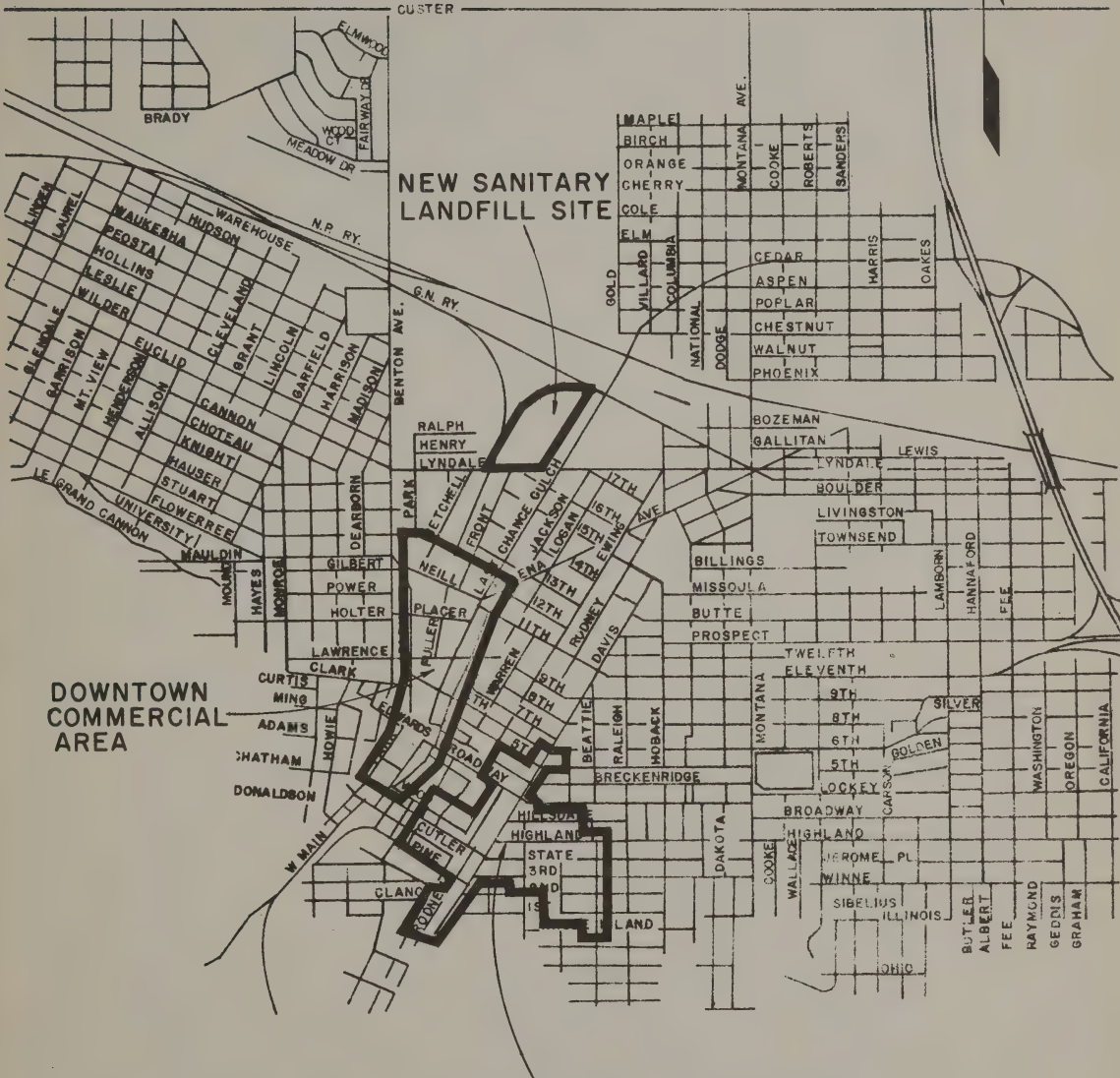
To compute the "Total Cost" of the "Commercial" collection, haul, and repair and maintenance operation on Form #7, the reference indicated for the outline explanation is XXXII. Section XXXII of the outline refers to outline section II a + b + c, XI a + b + c and XVII a + b. When referring to Sections II, XI and XVII, they are not broken down into subsections a, b, or c. However these sections refer to the outline procedures used in the steps preceding them or Sections I, X and XVI. These sections do have subsections a, b, and/or c. Therefore, when actually computing the data for Sections II, XI and XVII, they would be subdivided into a, b, and/or c as are Sections I, X and XVI. This method was used throughout the outline to simplify the explanation of the form where repeating an explanation of a section would have been superfluous.





# HELENA

N



LOCATION MAP



# RESIDENTIAL CONTAINER STORAGE SITE SURVEY

## RESIDENTIAL STUDY Feb. - March, 1970

Occupied Dwelling Units	495
Total Number of Racks Present	170
Number of Racks Fitting City Codes	110
% Unacceptable	35
Total Number of Cans Present*	504
Number of Cans Fitting City Codes	258
% Unacceptable	48
Total Number of Lids Present	323
Number of Lids Fitting City Codes	237
% Unacceptable	26
Total Cans Present	504
Total Lids Present	323
% of Cans without lids	36
Total Number of Cans Fitting Codes	258
Total Number Lids Fittings Codes	237
% of "good" Cans without lids	8
% of littered sites	21

\* All occupied dwelling units have a minimum of one refuse container.



RESIDENTIAL PLASTIC BAG  
QUESTIONNAIRE RESULTS AS OF MARCH 2, 1971

A. Success of questionnaire - 67%

B. In your opinion the bags are:	Excellent	59.0%
	Fair	29.9%
	Poor	5.7%
	Unanswered	5.7%

C. Do the bags stay tied?

Yes	88.70%
Fair	1.87%
No	4.67%
Unanswered	4.67%

D. Compared to cans, the bags are:

Easier to use	72.90%
About the same	12.15%
Harder to use	10.30%
Unanswered	4.67%

E. Are they hard to take out of the cans?

Yes	22.1%
No	73.8%
Unanswered	5.6%

F. Were any of your bags damaged?

tin cans	14%
dogs	49%
splitting/tearing	32%
other	10%
no damage	34%
unanswered	3%

About how many times?

Less than 10	44.8%
More than 10	16.8%
Unanswered	38.3%

G. What do the bags do for the appearance of your neighborhood?

Improve it	68.20%
About the same	22.10%
Make it worse	4.67%
Unanswered	6.54%

(continued next page)

Exhibit B





H. Would you be willing to pay a minimal amount (less than 10¢) for each bag?

Yes	58.90%
No	33.60%
Unanswered	7.47%

I. How many bags per week do you need?

1 bag - 6 responses	6 bags - 14 responses
2 " - 33 responses	7 " - 0 response
3 " - 17 responses	8 " - 1 response
4 " - 25 responses	9 " - 0 response
5 " - 3 responses	10 " - 1 response

J. Would you be willing to use the bags if they were made available to you, on a permanent basis?

Yes	86.00%
No	4.67%
Unanswered	8.41%



## DATA SUMMARY

### Survey Team Observations;

Tuesday 11/19/69

Odometer	31095.0	31096.0	15 min.	31102.0	31106.0	3 hrs. 10 min.	20 min.	6.0 miles	4.0 miles	8080#
----------	---------	---------	---------	---------	---------	----------------	---------	-----------	-----------	-------

Time	7:05 AM	7:10 AM	10:35 AM	10:55 AM	190 minutes

$$\text{Collection rate} = \frac{8080\#}{2000\# \text{ Ton}} = 141 \text{ man minutes/ton}$$

Tuesday 2/17/70

Odometer	654.0	655.1	10 min.	662.1	665.8	3 hrs, 20 min.	12 min.	7.0 miles	3.7 miles	9570#
----------	-------	-------	---------	-------	-------	----------------	---------	-----------	-----------	-------

Time	7:04 AM	7:08 AM	10:38 AM	10:50 AM	200 minutes
------	---------	---------	----------	----------	-------------

Collection rate = 9570#/2000# Ton  
= 125 man minutes/ton

## Exhibit C



Spring Survey (1)  
 Tuesday 5/19/70

	Leave Shop	Begin Route	Time Out For Breaks	End Route	Arrive at Landfill	Total Route Coll. Time	Total Haul Time	Total Route Mileage	Total Haul Mileage	Total Weight Refuse Coll.
Odometer	760.0	761.1	16 min.	765.8	769.8	2 hrs. 13 min.	18 min.	4.7 miles	5.1 miles	6950#
Time	7:03 AM	7:08 AM		9:37 AM	9:50 AM	133 minutes	or 133 minutes			
Odometer	769.8 (2)	773.9		776.3	780.6	1 hr. 12 min.	28 min.	2.4 miles	8.4 miles	5350#
Time	10:00 AM	10:13 AM	0	11:25AM	11:40 AM	72 minutes				

(1) Standby packer vehicle being used while regular truck in shop for repair. Standby unit will not carry all the refuse from this area in one load.

(2) Leave landfill.

$$\text{Collection rate} = \frac{(133 + 72 \text{ min.}) \times 3 \text{ men}}{6950\# + 5350\#/2000\#/ton} = 100 \text{ man minutes/ton}$$

Field Data Recorded by Truck Crew (Nov., 1969 - May, 1970)

Total Weight Refuse Collected	Total Route Collection Time	Collection rate
354,610#	7785 minutes	$\frac{7,785 \text{ min.} \times 3 \text{ men}}{354,610\#/2000\#/ton} = 132 \text{ man minutes/ton}$

(continued next page)

Exhibit C



RESIDENTIAL OBSERVATION AREADATA SUMMARYData taken after placement of new containers and racksWinter SurveyTuesday 12/1/70

Begin Route	Time Out For Breaks	End Route	Arrive at Landfill	Total Route Coll. Time	Total Haul Time	Total Route Mileage	Total Haul Mileage	Total Weight Refuse Coll.
Odometer 43175.0	43176.0 15 min.	43182.7	43183.9	3 hrs. 35 min.	5 min.	6.7 miles	1.2 miles	9000#
Time 7:00 AM		10:55 AM	11:00 AM	215 minutes				

Collection rate =  $\frac{215 \text{ min.} \times 3 \text{ men}}{9000\# / 2000\# / \text{ton}}$  = 143 man minutes/ton

Spring SurveyFriday 2/5/71

Begin Route	Time Out For Breaks	End Route	Arrive at Landfill	Total Route Coll. Time	Total Haul Time	Total Route Mileage	Total Haul Mileage	Total Weight Refuse Coll.
Odometer 61277.2	61278.3 27 min.	61284.6	61285.9	2 hrs. 18 min.	6 min.	6.3 miles	1.3 miles	5,475#
Time 7:02 AM		9:52 AM	9:58 AM	138 minutes				

Collection rate =  $\frac{138 \text{ min.} \times 3 \text{ men}}{5,475\# / 2000\# / \text{ton}}$  = 157 man minutes/ton





RESIDENTIAL RACK AND CAN  
QUESTIONNAIRE RESULTS AS OF MARCH 2, 1971

A. Success of questionnaire - 59%

B. In your opinion the racks and cans are:	Excellent	91.30%
	Fair	6.73%
	Poor	0 %
	Unanswered	1.92%

C. Have you had any difficulty with the rack?	Yes	5.77%
	No	91.30%
	Unanswered	2.87%

D. Have the cans or rack (or both) been vandalized?	Yes	1.92%
	No	97.00%
	Unanswered	.96%

E. Have any of the facilities (rack or cans or both) been stolen?		
	Yes	.96%
	No	97.00%
	Unanswered	1.92%

F. Have dogs been able to disturb the facilities?		
	Yes	1.92%
	No	97.00%
	Unanswered	1.92%

G. Do the cans and lids get dented?		
	More	.97%
	Less	69.40%
	About the same	26.90%
	Unanswered	3.84%

H. Do you think this project has helped keep your neighborhood cleaner?		
	Yes	86.50%
	No	7.60%
	Unanswered	5.78%



COMMERCIAL OBSERVATION AREA - Initial Data Summary  
Data taken prior to installation of new bulk containers

Route, Date & Season	Total No. of Commercial Services	No. of Residential Services	No. of Containers Handled (1)	No. of Bulk Containers (4)	No. of Hand Loads (4)	No. of Services Over 1 Min.	Total Route Length(mi.)	Total Weight Collected # (3)
Tuesday 9/9/69 Night Fall	176	5	370	0	1046	70	14	12,810
Tuesday 2/3/70 Night Winter	165	1	359	1	1131	53	14.8	14,200
Tuesday 5/19/70 Night Spring	165	0	370	2	1061	59	15.0	14,800
Thursday 2/5/70 Night Winter	175	13	368	1	712	54	16.0	13,400
Monday 5/18/70 Night Spring	178	0	471	2	804	65	15.6	18,100
Wednesday 9/10/69 Evening Fall	63	30	219	0	372	47	8	6,600
Wednesday 2/4/70 Evening Winter	66 (2)	63 (5)	107	18	430	23	10	8,790
Wednesday 5/20/70 Evening Spring	64	67	98	18	347	21	11.3	8,450
Monday 2/16/70 Evening Winter	86	23	209	18	545	42	14.5	11,800
Thursday 5/21/70 Evening Spring	45	114	141	4	261	26	13.0	11,040
Total of Averages Per Route	237	64	543	13	1341	92	26	24,006

(1) Excludes bulk containers and residential services.

(2) Bulk containers replaced 97 -32 gallon standard containers at 12 services.

(3) Includes all services collected.

(4) Excludes residential services collected

(5) Increased number of residential services being collected on the route.



## COMMERCIAL OBSERVATION AREA - Final Data Summary

### Data taken after installation of new bulk containers

Route, Date & Season	Total No. of Commercial Services	No. of Residential Services	No. of Containers Handled (1)	No. of Bulk Containers(2)	No. of Hand Loads (3)	No. of Services Over 1 Min. Length(mi.)	Total Route Weight Collected # (4)
New Thursday							
3/4/71	177	14	188	69	625	74	21.6
Commercial Winter							18,050 #

- (1) Excludes bulk containers and residential services.
- (2) Includes those furnished by City plus privately owned containers.
- (3) Excludes residential services collected.
- (4) Includes all services collected.





HELENA SOLID WASTES  
BULK CONTAINER TIME SURVEY SUMMARY

Container No.	Location of Container	Size of Container C.Y.	Avg. Time Before Bulk Container Placement		Avg. Time After Bulk Container Placement	
			Min.	Sec.	Min.	Sec.
1	Stewart Homes	2	)			
2	" "	2	)			
3	" "	2	)			
4	" "	2	)			
5	" "	2	)	20	50	13 06
6	" "	2	)			
7	" "	2	)			
8	" "	2	)			
9	" "	2	)			
10	" "	2	)			
11	Almanor Apartments	2	)			
12	" "	2	)			
13	" "	2	)	--	--	5 44
14	" "	2	)			
15	Holiday Motel	2	--	--	1	48
16	Airport Cafe	1	--	--	0	50
17	Civic Center	2	--	--	1	18
18	Rocky Mtn. Development	2	--	--	1	10
19	Senior High School	2	3	55	1	35
20	Junior High School	2	1	47	2	10
21	Sunhaven Jr. High School	2	2	35	1	30
22	C.R. Anderson School	2	2	01	3	20
23	Broadwater Grade School	2	2	15	0	55
24	Central Grade School	2	2	45	1	13
25	Montana Graphic Arts	2	--	--	1	0
26	Shodair Crippled Children Hosp	2	3	15	1	05
27	Scheffi's Restaurant	2	1	26	1	40
28	Herb's Grocery	2	1	14	2	15
29	Albertson's Grocery	2	1	42	0	45
30	Clover Leaf Dairy	2	--	--	1	25
31	Suds Hut	2	1	39	1	20
32	Safeway Grocery	2	0	30	0	05
33	Imperial Bowling Lanes	2	0	50	0	45
34	Hap's & Rocky Mtn. Bars	2	1	37	1	20
35	Burlington-Northern Depot Cafe	2	2	27	1	0
36	Capital Bowling Lanes	2	2	31	0	55
37	Peter Pan Cafe	2	1	05	1	00
38 & 39	Independent Record	2	5	51	3	20
40	Coca Cola Bottling Co.	2	1	58	2	00



Container No.	Location of Container	Size of Container C.Y.	Avg. Time Before Bulk Container Placement		Avg. Time After Bulk Container Placement	
			Min.	Sec.	Min.	Sec.
41	Bair's Cafe	2	1	45	1	40
42	Jorgenson's Holiday Inn Caf e	2	2	54	1	40
43	Penkay Eagles Manor	2	2	04	1	20
44	Carroll College	2 See #51	--	--	--	--
45	The Hofbrau	2 below	1	45	1	20
46	Western Drug	2	2	26	1	30
47	Dapper Dans & Convenient Mart	2	--	--	2	25
48	Western Trailer Town	2	1	57	1	30
49	" " "	2	1	22	1	20
50	4'B's Cafe by Gerties	2	1	33	2	20
51	Carroll College	2	3	30	2	10
52	Municipal Airport	2	--	--	1	05
53	New Colonial Motel	2	--	--	5	45
54	Treasure State Sporting Goods	1	--	--	0	55
55	Artic Circle Drive Inn	2	1	15	0	50
56 & 57	Imperial 400 Motel	1	0	56	0	50
58	Montana Deaconess Home	2	1	18	0	55
59	" " "	2	1	34	1	15
60	Dr. Strizich Office	1	--	--	--	--
61	Super Save Grocery	2	* 20	42	* 1	20
62	Mountain States Telephone Co.	1	3	44	1	00
63	Mountain Bell Telephone Co.	2	2	20	1	40
64	Helena Meat Co.	2	2	30	1	15
65	Family Hose (Circle) Drive In	2	1	32	0	45
66	Golden Cache Cafe	2	0	55	1	00
67	Railroad Commission	2	--	--	1	25
68	Burgess & Little Clinic	2	0	53	1	15

\* Not included in average time totals for report because new incinerator installed reduces output of refuse to bulk container.













## Daily Performance

Time out

Mileage out \_\_\_\_\_

Minutes taken off for lunch

REMARKS

REMARKS

REMARKS

Date:     /     /

Truck #

Crew #

Net Time

Net Miles

Gas (gal.)

CHECK IF  
ABNORMALEng. Temp. Oil Press.  Ammeter Packer ☐Other ☐

Time Start	Time Finish	Weight	Weighmaster Signature
------------	-------------	--------	-----------------------

Route #

Total Weight

INSTRUCTIONS: Time in, Time out, Mileage in, and Mileage out to be completed by foreman. All additional data to be inserted by the driver. Time start and time finish refer to the times garbage collection was actually begun and ended on each route or part of route serviced between trips to the disposal site.



Form #4

COMPLAINT NOTICE

Date Received: \_\_\_\_/\_\_\_\_/\_\_\_\_

Type of Complaint: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Street: \_\_\_\_\_

-----  
Copy to be completed by supervisor to employees involved.

Route \_\_\_\_\_

Loader: \_\_\_\_\_

Driver \_\_\_\_\_

Loader: \_\_\_\_\_



For Period: \_\_\_\_\_

Truck Ident.	Date	Odo. Mile- age	Type Service or Repair	Hours Down	Labor Hrs.	Parts Descript.	Labor Cost	Parts Cost	Out- side Charge	Total Cost
TOTALS	X	X	X			X				





CREW PERFORMANCE EVALUATION

Garage \_\_\_\_\_ For week of \_\_\_\_\_

Type	Total Working Hrs.	Hrs. on Route	Hrs. on Haul	Tons Collected	On Route Man Minutes/Ton
RESIDENTIAL WASTE					
COMMERCIAL WASTE					
BULKY WASTE					
DISPOSAL CREWS					
TOTALS					
AVERAGE					



# MONTHLY OPERATING COST SUMMARY

Form #7  
(Revised)

For Period: From: \_\_\_\_\_ To: \_\_\_\_\_

Collection & Haul Operations:	Factor	Residential \$ or Amount	Commercial \$ or Amount	Bulky Waste \$ or Amount
Route Service Cost Center	Cost/Ton			
	% Time on Route			
	Man Minutes/Ton			
Hauling Cost Center	Cost/Ton			
	Tons / Equip. hr.			
Repair & Maintenance Cost Center	Cost/Ton			
	Cost/Equip. hr.			
	Parts Cost			
	% Time Equip. Down			
Collection & Haul Totals	Tons Collected			
	Total Cost			
	Total Cost/Ton			

Disposal Operations	Factor	Total Tonnage
Disposal Cost Center	Cost/Ton	
	Total Tons to Landfill	
	Tons Disposed/ Labor Hr.	
	Tons Disposed/ Equip. Hr.	
Disposal Repair & Maintenance Cost Center	Cost/Ton	
	Cost/Equip. Hr.	
	Parts cost	
	% Time Equip. Down	
	TOTAL COST/TON	

Collection & Haul	
TOTAL	
Disposal	
Total	
GRAND TOTAL	



Equipment Identification	Total Miles	Total Hours	Hours Down	Mechs. Labor	Parts Cost	Fuel Cost	Oil & Lube, Cost	Repair & Maint., Per/Hr.	Fuel Cost Pr/Hr.	Total Cost /hr.	Total Cost
TOTALS								X	X	X	





(for use by acctg. dept. only)

**INSTRUCTIONS:** To be filled out by accounting dept., or supervisor. "EST. LIFE" should be based on supervisor's estimate of remaining life. Depreciation may be on a straight-line or accelerated basis.





Date:

For use by acctg. dept. only)

ITEM	CATEGORY*	DESCRIPTION	DATE PUT IN USE	NEW COST	EST. TOTAL LIFE	OTHER ELEMENTS	ANNUAL DEPRECIATION	MONTHLY DEPRECIATION
Land					X		XXXXXXXXXXXXXX	XXXXXXXXXXXXXX
Buildings								
Garages								
Roads								
Fences								
Utilities								
Equipment								
Inventory								
TOTALS	X	X	X		X	X		

**INSTRUCTIONS:** To be completed by supervisor or accounting dept., if they have data available.

"EST. TOTAL LIFE" should be based on remaining life as estimated by the supervisor.

Depreciation may be either straight-line or on an accelerated basis.

Residential collection and haul equipment = R.C. & H., Commercial collection and haul equipment = C.C. & H.,

Residential collection and haul equipment = R.C. & H.; Commercial collection and haul equipment = B.W.C. & H.; Disposal Equipment = D.

CATEGORY:



DISTRICT: \_\_\_\_\_

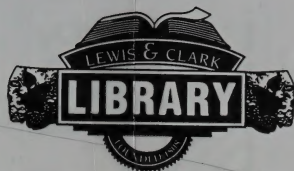
PERIOD OF REPORT: From \_\_\_\_\_ to \_\_\_\_\_

DATA	FOR THIS PERIOD	BUDGET-THIS PERIOD	YEAR TO DATE	BUDGET -YEAR TO DATE
<b>RESIDENTIAL COLLECTION</b>				
<b>TONS OF REFUSE COLLECTED</b>				
Total Operating				
Total Depreciation Cost				
<b>TOTAL COST</b>				
Operating Cost per Ton				
Depreciation Cost per Ton				
<b>TOTAL COST PER TON</b>				
<b>COMMERCIAL COLLECTION</b>				
<b>TONS OF REFUSE COLLECTED</b>				
Total Operating				
Total Depreciation Cost				
<b>TOTAL COST</b>				
Operating Cost per Ton				
Depreciation Cost per Ton				
<b>TOTAL COST PER TON</b>				
<b>BULKY WASTE COLLECTION</b>				
<b>TONS OF REFUSE COLLECTED</b>				
Total Operating				
Total Depreciation Cost				
<b>TOTAL COST</b>				
Operating Cost per Ton				
Depreciation Cost per Ton				
<b>TOTAL COST PER TON</b>				
<b>DISPOSAL</b>				
<b>TONS OF REFUSE COLLECTED</b>				
Total Operating				
Total Depreciation Cost				
<b>TOTAL COST</b>				
Operating Cost per Ton				
Depreciation Cost per Ton				
<b>TOTAL COST PER TON</b>				

**INSTRUCTIONS:** To be completed by the accounting dept. from data available in operating cost report, capital cost reports when requested, or periodically. Copies sent to City Manager.







Lewis & Clark Library  
120 S. Last Chance Gulch  
Helena, MT 59601



120 S Last Chance Gulch  
Helena, MT 59601  
[www.lclibrary.org](http://www.lclibrary.org)



